
Particle ratios in PHENIX at RHIC



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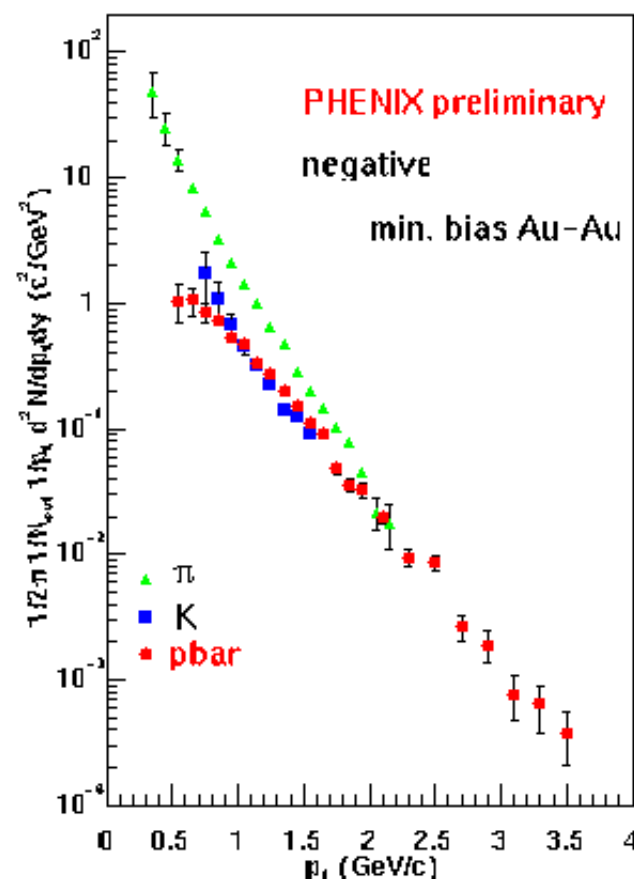
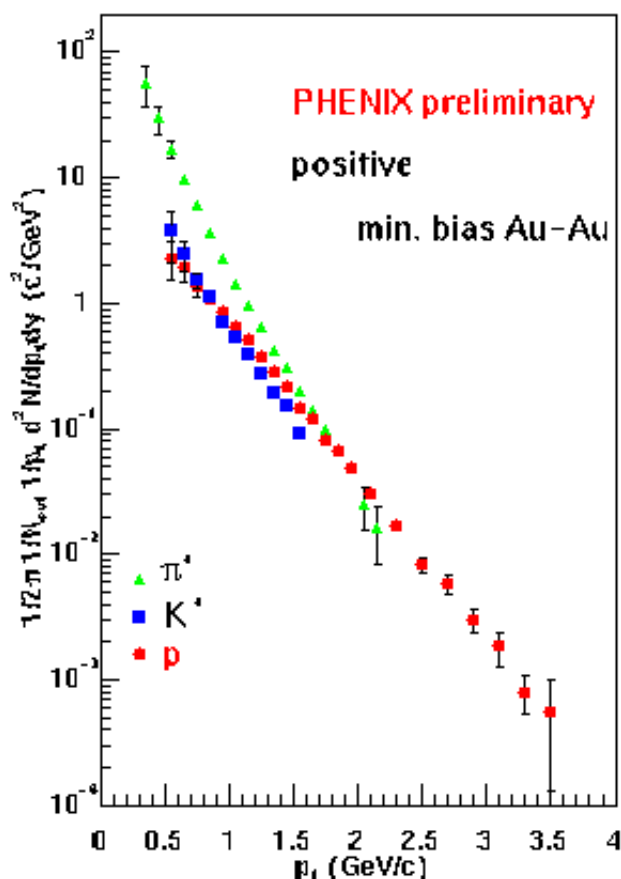
Motivation

- * Investigation of particle production mechanism in heavy ion collisions.
 - * What can we learn from Particle ratios?
 - * Ratios contain basic information about collision dynamics.
 - * Chemical potential of quarks. $\rightarrow \mu_S$ and μ_B
 - * Chemical freeze out temperature.
 - * Degree of baryon stopping power. $\rightarrow p_{\text{bar}}/p, \mu_B$
 - * This information will define boundary conditions of collision dynamics.
 - \rightarrow Conditions at Freeze-out.
- This will be a first step to investigate whether Quark-Gluon-Plasma is formed or not.

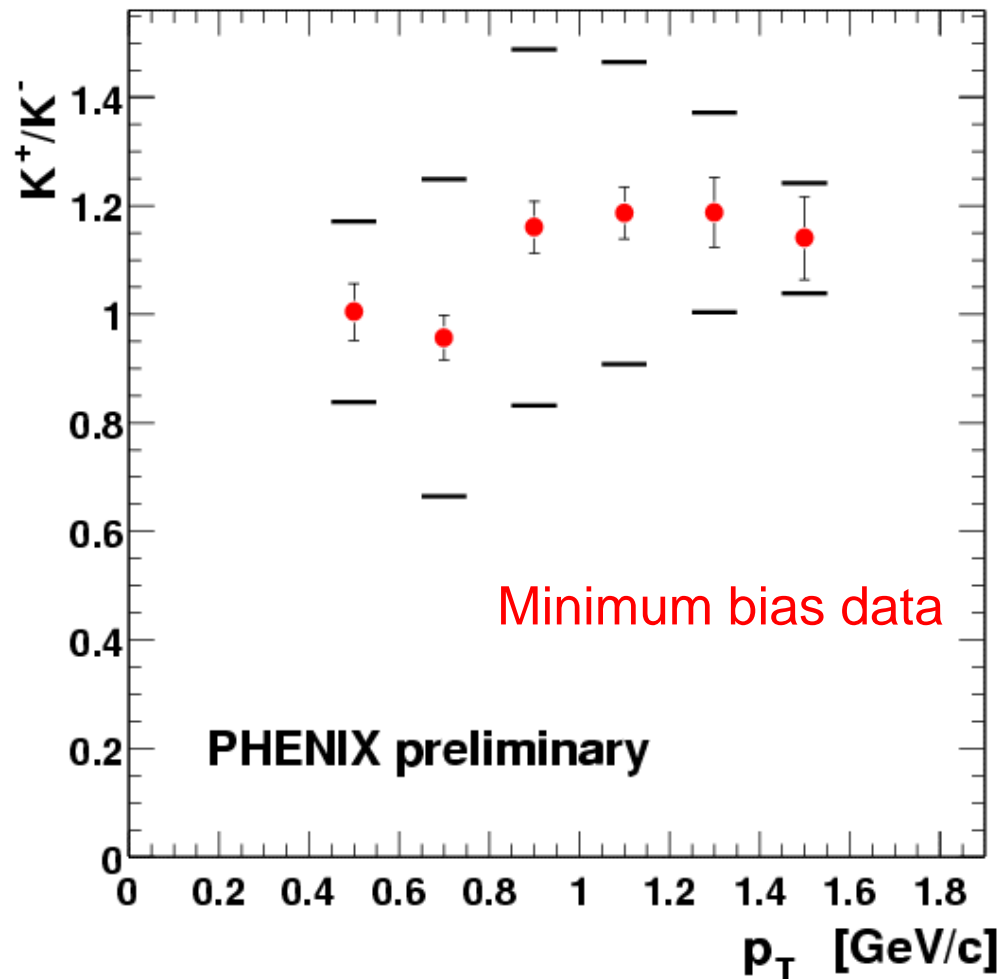
Identified Hadron spectra

- * Single particle spectra of pion, kaon, proton and their anti particles.

Au+Au collisions at $\sqrt{s_{NN}}=130$ GeV, Minimum bias data.

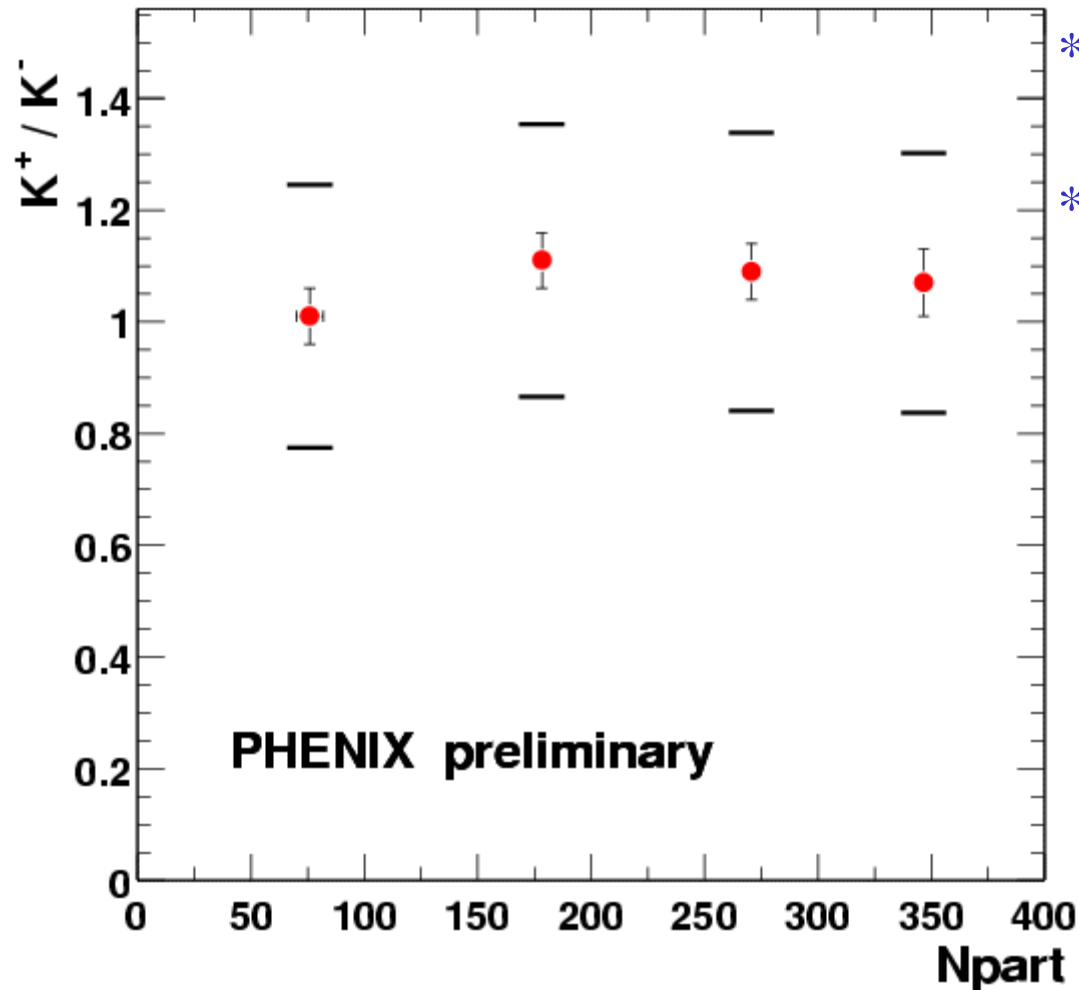


K⁺/K⁻ ratio as a function of P_T



* Within the systematic errors,
K⁺/K⁻ does not depend on P_T
over the measured range

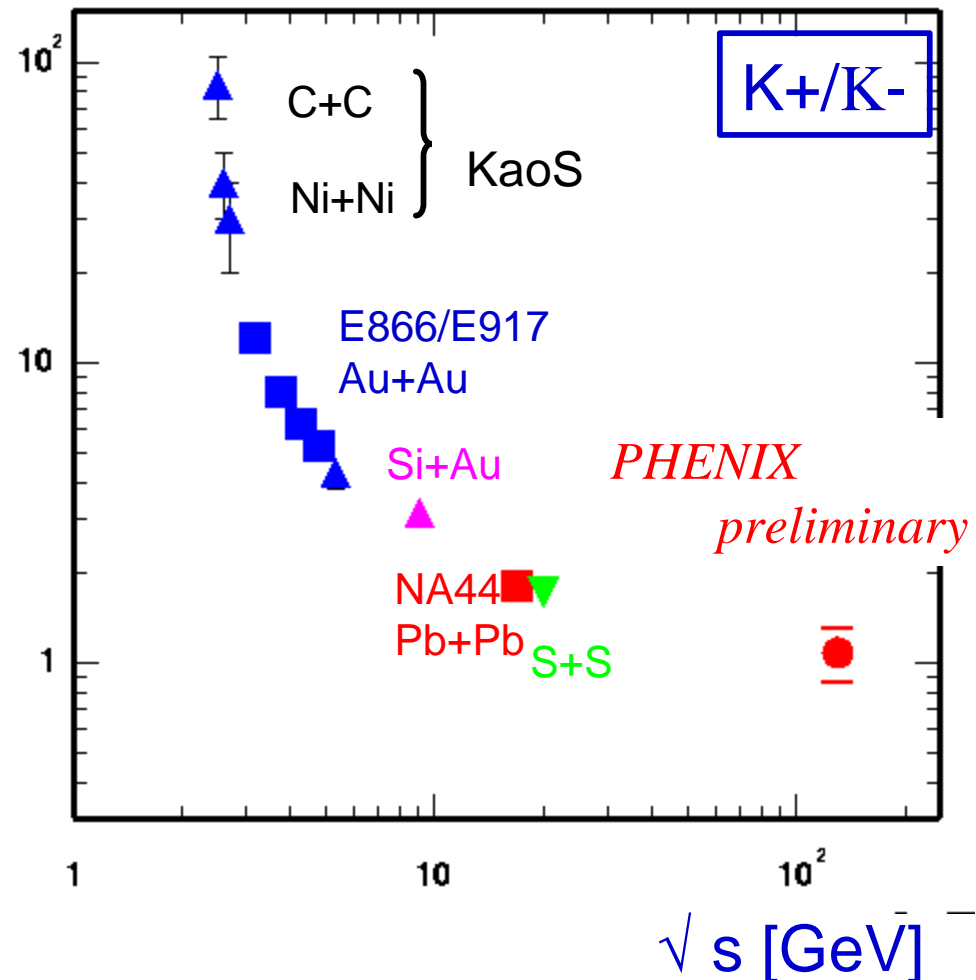
K⁺/K⁻ ratio as a function of centrality



- * No dependence as a function of centrality.
- * A similar lack of centrality dependence was observed in experiments at SIS, AGS and SPS.

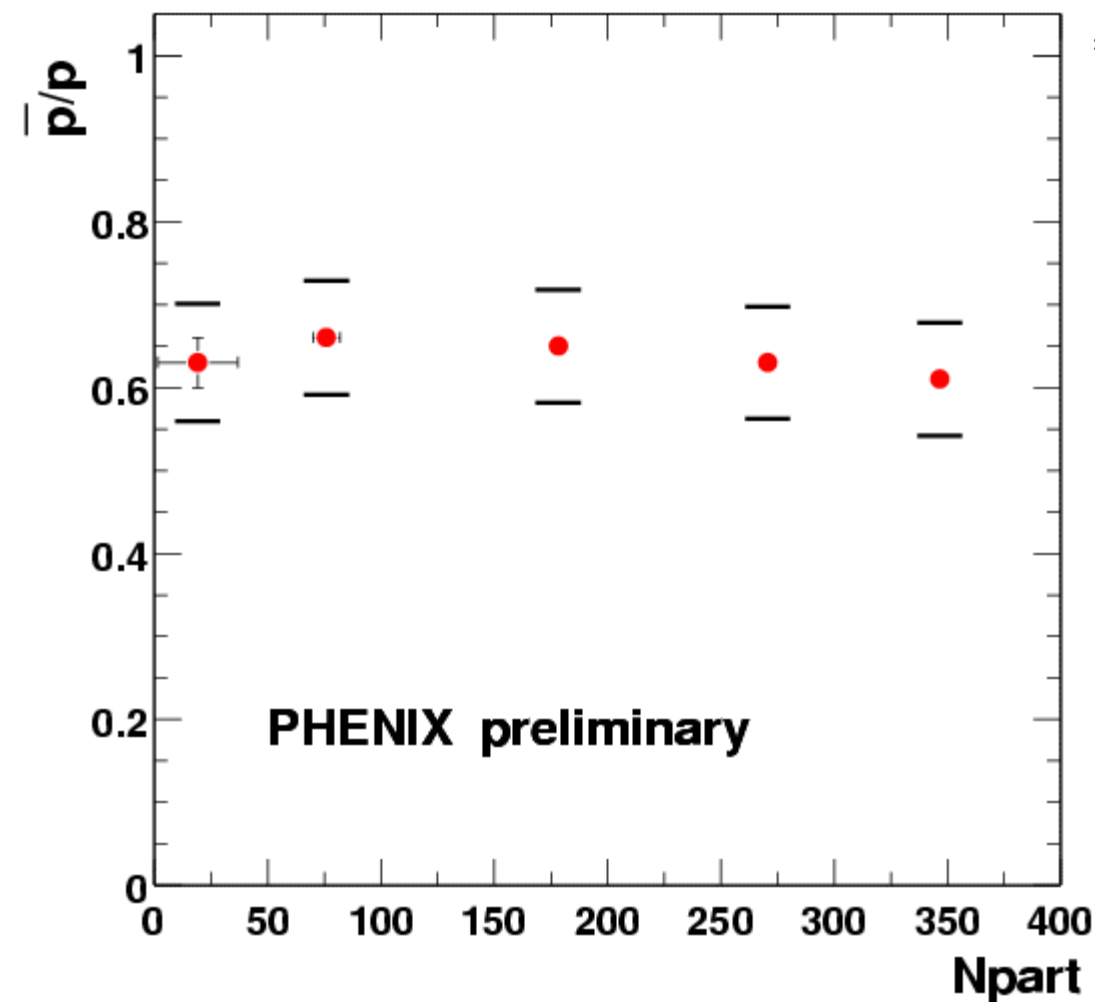
Summary of K^+/K^- ratio

- * K^+/K^- ratio decreases as a function of \sqrt{s}
($0.8\text{GeV}/c < P_T < 1.6\text{GeV}/s$)
- K^+/K^- @ Min.Bias
 $= 1.08 \pm 0.03(\text{stat}) \pm 0.22(\text{sys.})$
- * K^+/K^- production at RHIC follows the trend observed in the experiments at SIS, AGS and SPS.



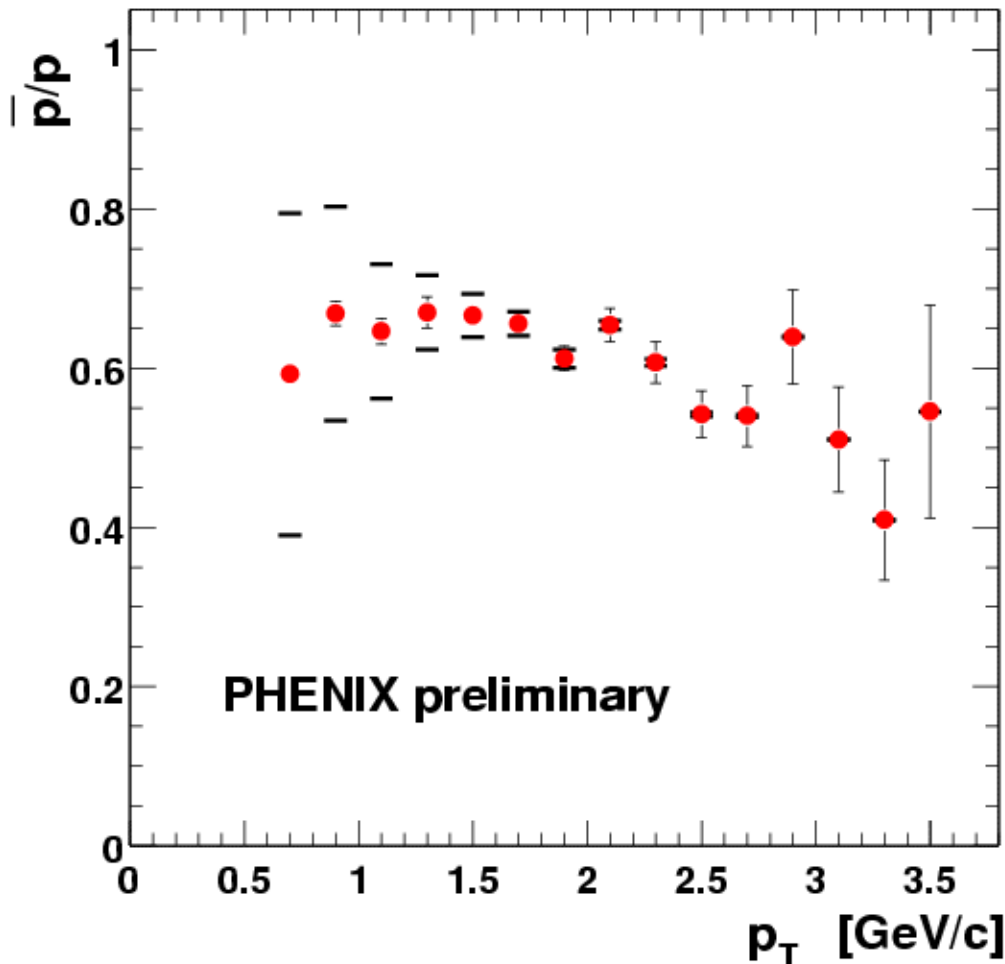
pbar/p ratio as a function of centrality

pbar/p ratio @ mid rapidity



* No strong dependence
as a function of centrality.

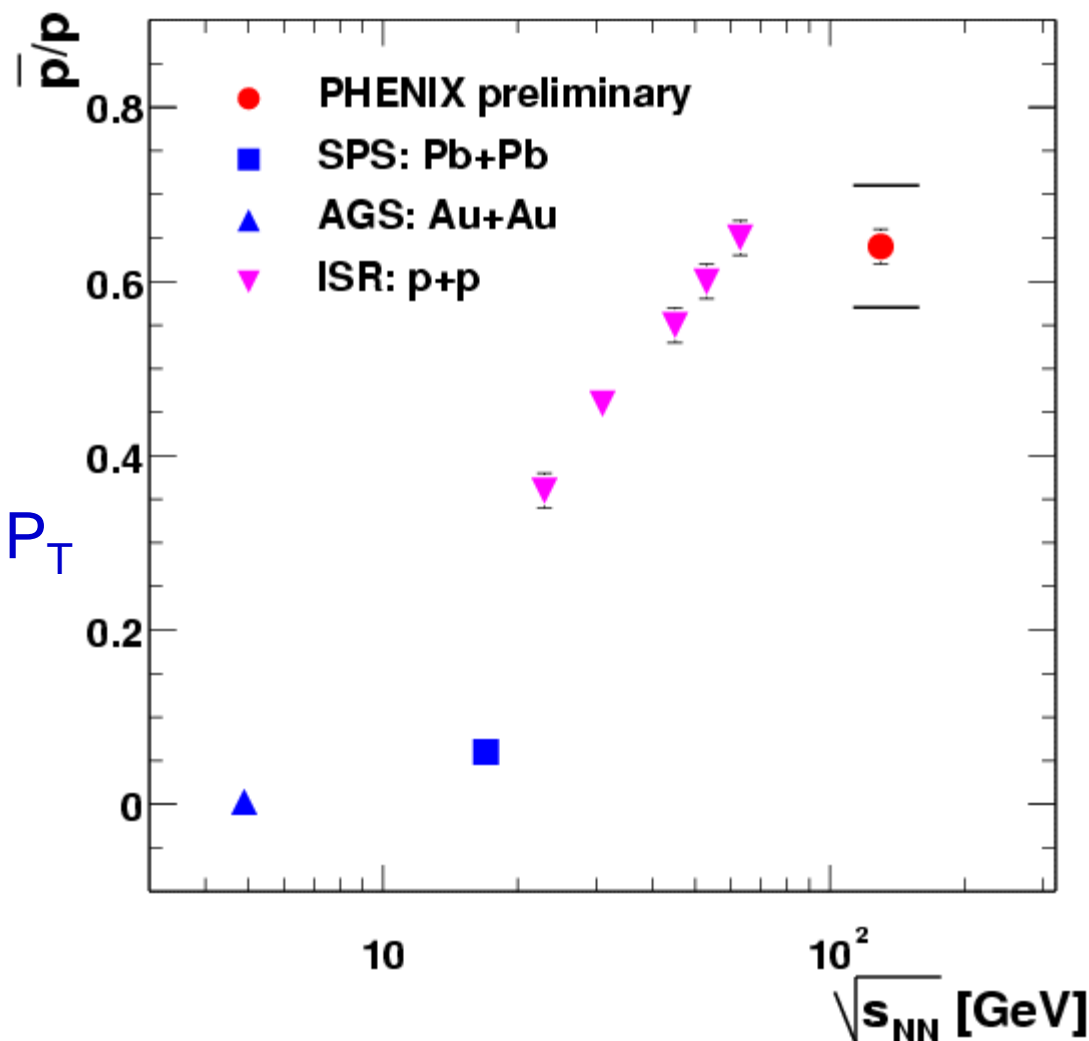
\bar{p}/p ratio as a function of P_T



- » \bar{p}/p ratio is either flat or falling slightly at higher p_T values.
- » It is very hard to extract \bar{p}/p ratio at P_T above 3 GeV/c due to small statistics.

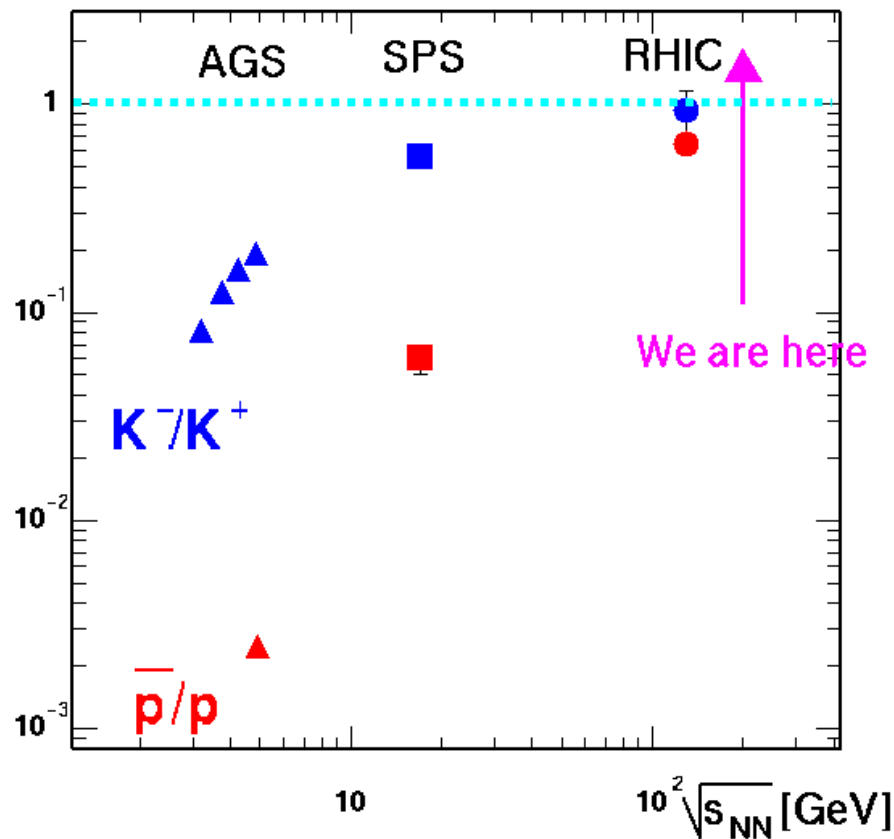
Summary of pbar/p ratio

- * pbar/p ratio at RHIC is dramatically increasing from AGS and SPS energy.
- * No clear Centrality and P_T dependence are seen within errors.

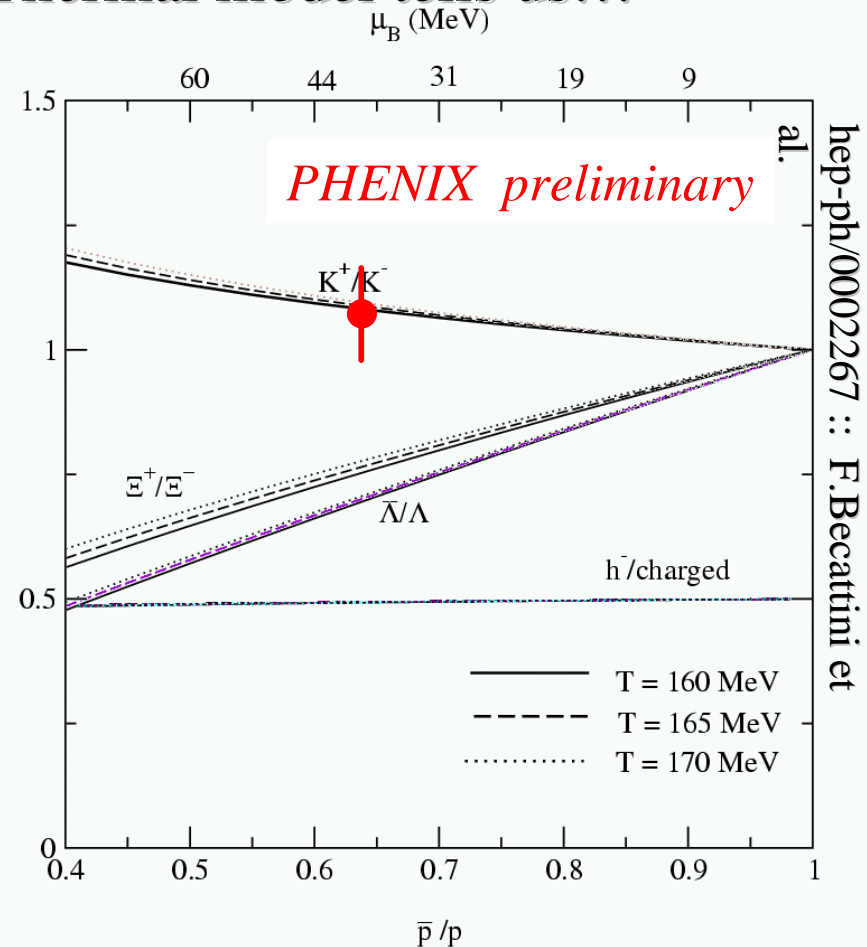


Summary of K^+/K^- and $p\bar{p}/p$

- * Both K^+/K^- and $p\bar{p}/p$ are closing to 1.0 from AGS to RHIC

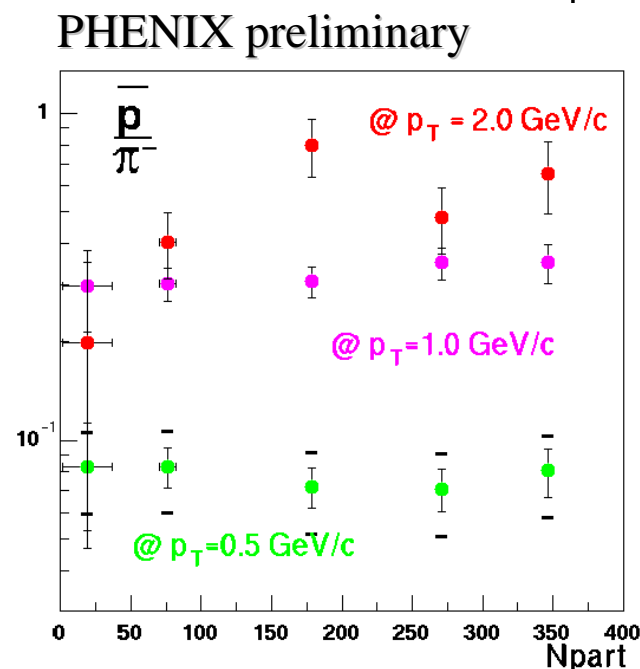
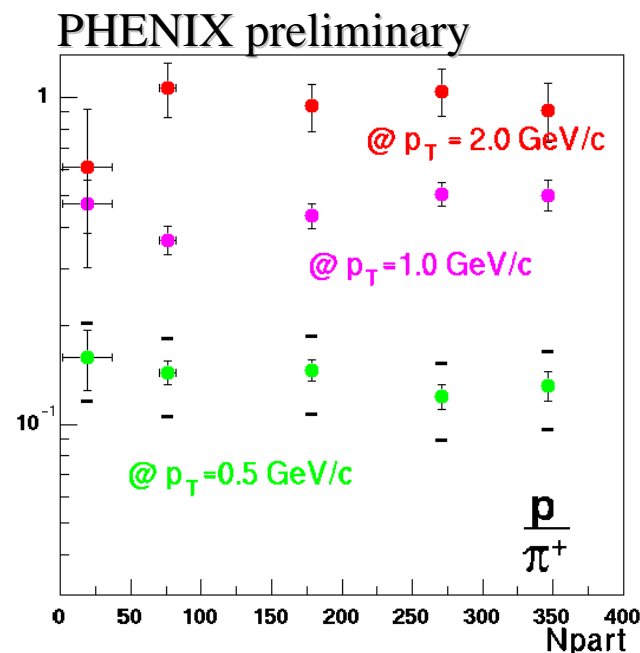
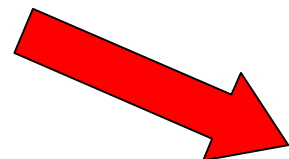
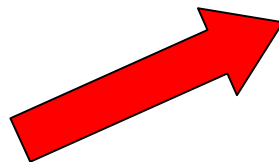
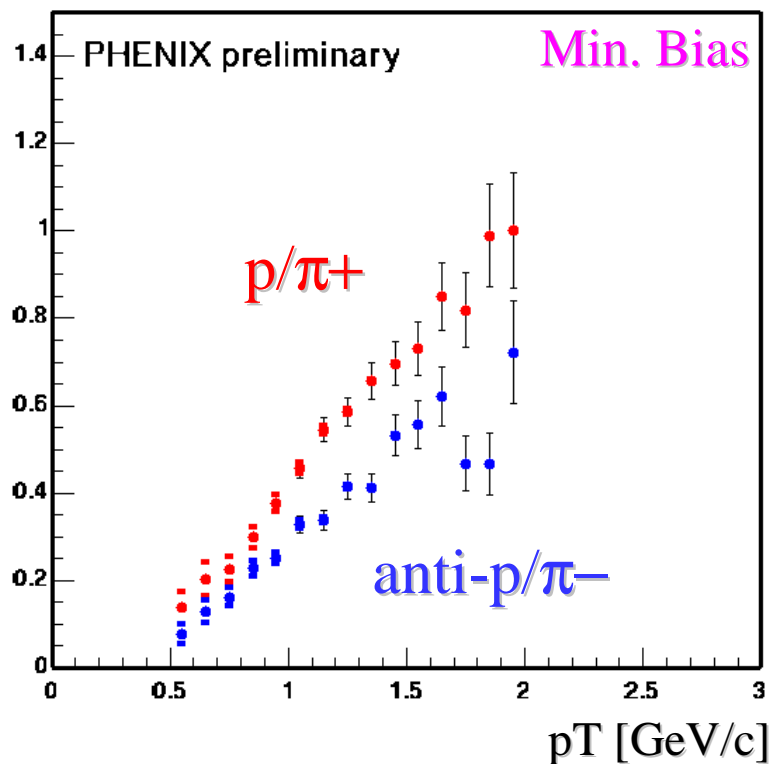


Thermal model tells us...



Baryon chemical potential ~ 40 MeV
Not baryon free ($\mu_B \neq 0$).

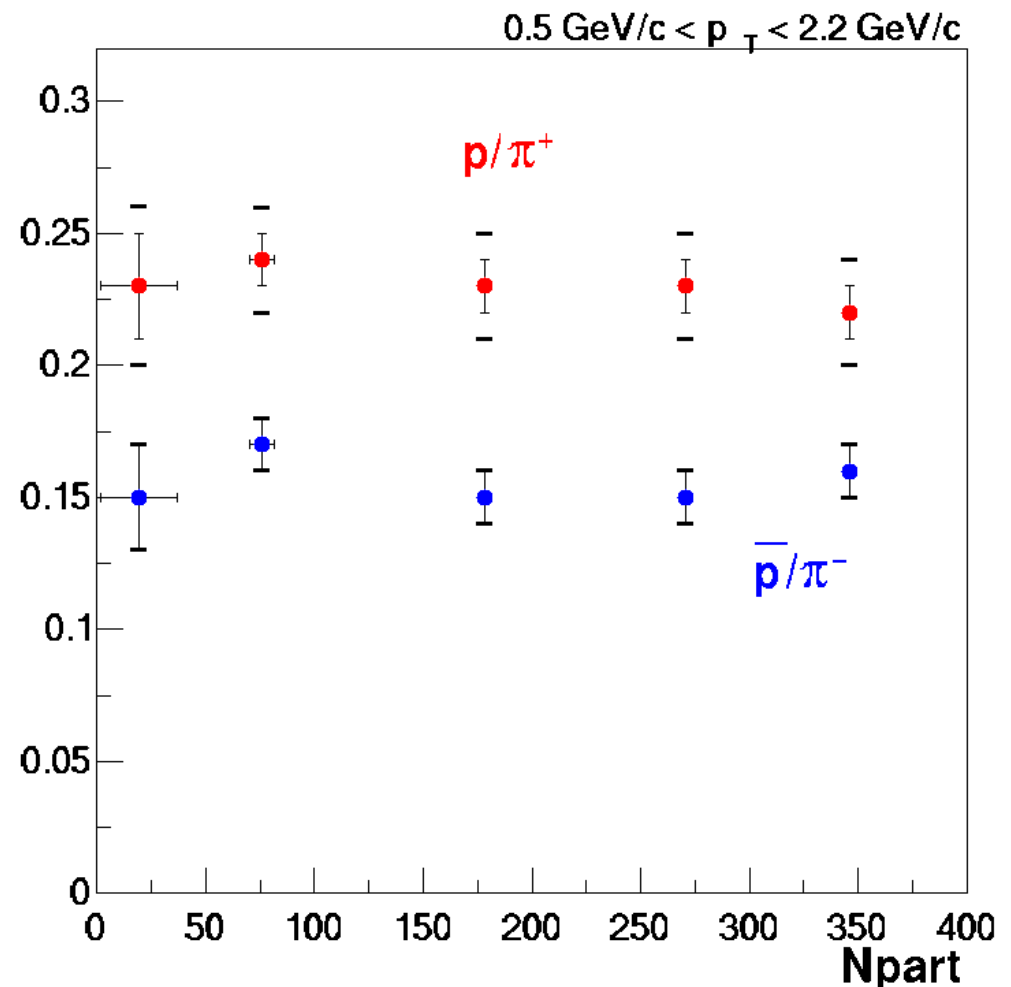
p/π^+ and $\text{anti-}p/\pi^-$ as a function of p_T



p/π^+ and $\text{anti-}p/\pi^-$ ratio @ $p_T = 2.0$ GeV/c
decreases dramatically
at small Number of participants.

p/π^+ and \bar{p}/π^-

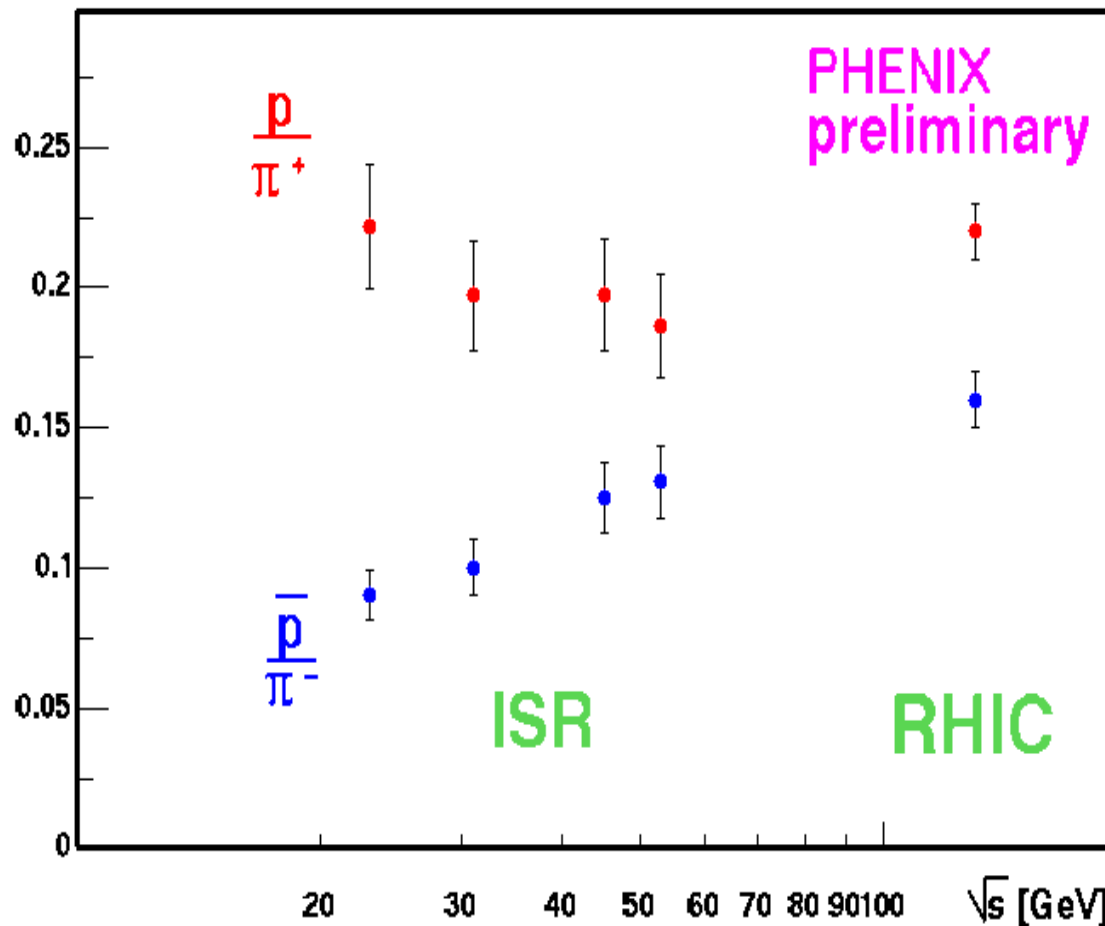
- * p/π^+ and \bar{p}/π^- ratios integrated within $0.5 \text{ GeV}/c < p_T < 2.2 \text{ GeV}/c$.
- * No strong dependence as a function of centrality.



p/π^+ and \bar{p}/π^-

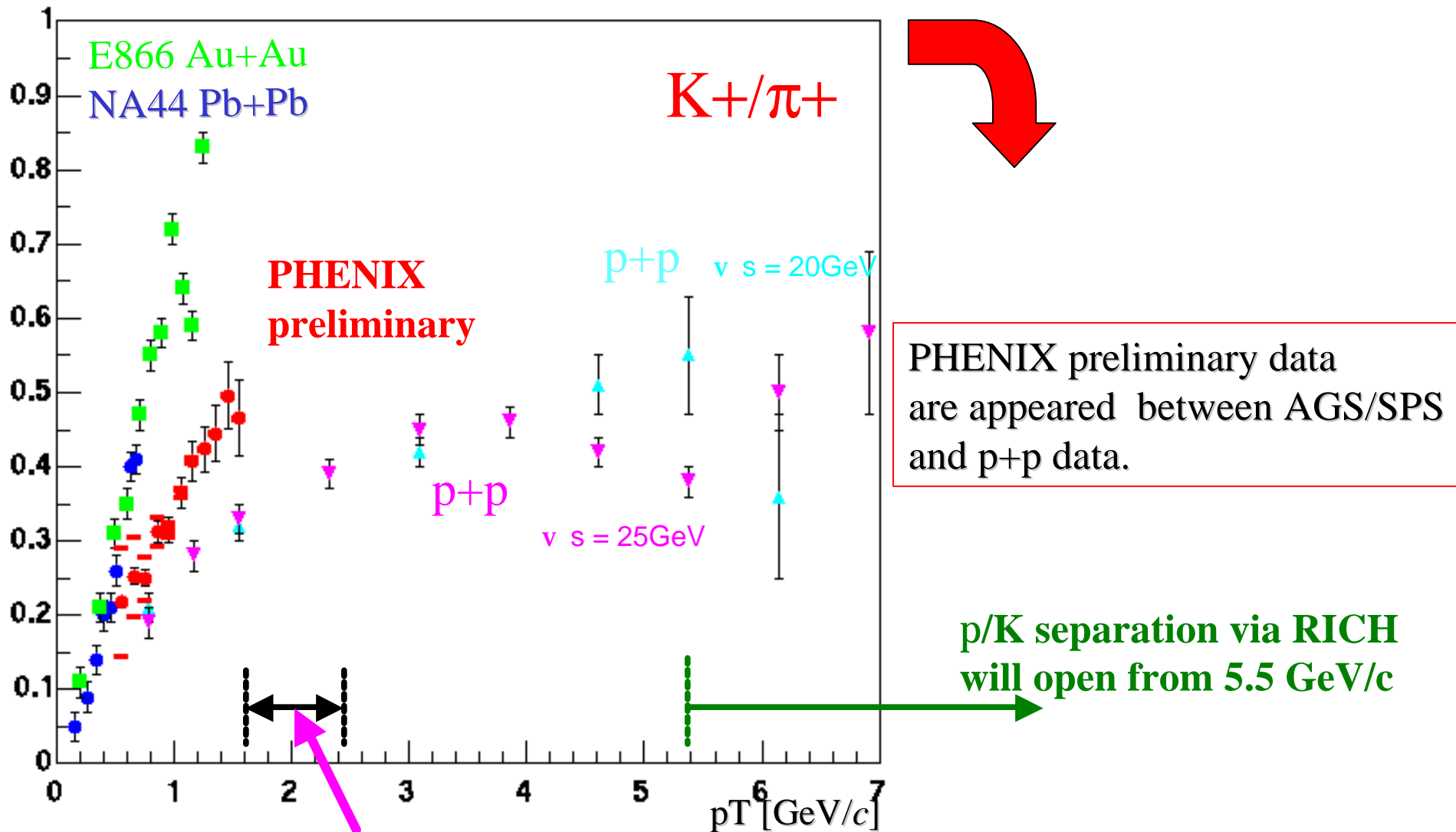
- * Ratios as a function of collision energy.

$0.5 \text{ GeV}/c < p_T < 2.2 \text{ GeV}/c$



p/π^+ and \bar{p}/π^- ratio at RHIC getting close to the value at p+p collisions.

PHENIX K^+/π^+ ratio



Conclusion

- * Particle ratios in Au+Au collisions at $\sqrt{s}=130$ GeV are presented.
- * No clear centrality dependence is seen in K^+/K^- and $pbar/p$ ratios.
- * K^+/K^- and $pbar/p$ ratios show no dependence with P_T .
(Kaon; $P_T < 1.6$ GeV/c, Proton; $P_T < 3.0$ GeV/c)
- * Particle ratios @ minimum bias, @ mid rapidity
 - * $K^+/K^- = 1.08 \pm 0.03(\text{stat.}) \pm 0.22(\text{sys.})$
 - * $pbar/p = 0.64 \pm 0.01(\text{stat.}) \pm 0.07(\text{sys.})$
- * K^+/K^- and $pbar/p$ ratios are dramatically decreasing / increasing from SPS and AGS energies.
- * K/π and p/π ratios increase as a function of P_T .
 p/π^+ and $pbar/\pi^-$ ratio are clearly approaching to 1.0.
- * Baryon density at RHIC is much less than AGS and SPS, but not baryon free at mid rapidity.